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SPECIFICATIONS OF SOVIET YaAZ-210 SERIES TRUCKS

V. V. Osepchugov, Stalin Prize Winner

/Tables and figures referred to are appended./

The use of trucks for short hauls to replace rail transport has necessitated the production of trucks with good dynamic qualities capable of carrying heavy loads. The use of modern heavy trucks reduces expenditures on servicing, fuel, and lubricants. Table 1 shows the marked reduction in fuel consumption per ton per kilometer achieved by increasing the load capacity of the truck.

The comparatively high average tonnage of the USSR motor vehicle park is being raised by the production of 7-ton trucks. Along with the production of 7-ton trucks, a new task was set: to design a 12-ton, 6-wheel truck, and dump trucks and tractor trucks based on it.

YaAZ-210 Six-Wheel Truck

Maximum unification of aggregates, parts, norms, technological elements, and materials with those of the four-wheel YaAZ-200 truck was a basic factor in the design of the YaAZ-210 truck. (For details on the YaAZ-200 truck, see article by V. V. Osepchugov in Avtomobil'naya Promyshlennost', No 2, 1947.) Eighty-three percent of the parts of the six-wheel YaAZ-210 made by the Yaroslavl' Automobile Plant are identical with those of the four-wheel YaAZ-200 truck. Table 2 gives unification data within the limits of design groups.

The scope of unification is also characterized by the degree of unification of technological elements. Thus, no new splined joints, threads, or materials were introduced into the design of the six-wheel truck that were not in the four-wheel truck. All parts of the six-cylinder engine /YaAZ-210/ differing from the corresponding parts of the four-cylinder engine /YaAZ-200/ have their elements unified to the maximum extent.

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The 12.00 x 20 tires used on the YaAZ-210 define the maximum load of the vehicle. Each of the ten tires carries a maximum load of 2,500 kilograms; thus, each axle can carry 10 tons. With a load of 4 tons on the front axle and a load of 10 tons on each of the two rear axles, the vehicle weight capacity is 24 tons. The weight of the truck itself is between 10 and 11 tons, and thus the effective load capacity is 12 tons.

The YaAZ-210 truck is equipped with a 168-horsepower, six cylinder diesel engine. (For details on the engine, see article by I. S. Khanin in Avtomobil'naye Promyshlennost', No 6, 1948.)

The dry, single-disk clutch has an external lining diameter of 381 millimeters and an internal diameter of 203 millimeters. It is similar to the clutch of the four-wheel YaAZ truck, but larger.

1. Transmission

The gear ratio of the reduction gear is the same as on the YaAZ-200 (8.21:1). The transmission constant of the transfer case is 1.07:1, which has the effect of increasing the gear ratio of the reduction gear to 8.80:1.

The gear ratios of the five-stage transmission are preserved unchanged. As a result, we get the following calculated dynamic parameters: highest speed in overdrive, 58 kilometers per hour; in direct drive, 45 kilometers per hour; dynamic factor in direct drive, 0.042 kilogram per kilogram; in direct drive at a speed of 30 kilometers per hour, the loaded truck can ascend a grade of 2.6 percent (1 degree 30 minutes). A gear ratio in first gear in the transmission of 6.17:1, and in the transfer case of 2.13:1, enables the truck to surmount grades up to 40 percent (22 degrees) and to maintain a minimum speed of 4 kilometers per hour over difficult stretches of road when the engine is turning at 1,500 revolutions per minute. Maximum tractive force in direct drive is 1,070 kilograms.

The relationship between power, weight, and gear ratio of the transmission selected provides good dynamic qualities.

On roads with weak surfaces and in cross-country driving, the load capacity of the truck should be reduced to 10 tons in view of the road conditions and to improve the dynamic qualities of the truck.

The double row of universal shafts used to turn the driving axles has the following advantages:

a. It makes it possible to use a reduction gear completely unified with the reduction gear of the four-wheel truck. By moving the ball of the rear axle beam 80 millimeters to one side of the axis and revising the rear axle beam, we obtain [in the YaAZ-210] a displacement of the reduction gears sufficient to permit linking a propeller shaft to each reduction gear.

b. It makes it possible to change the gear ratio of the transmission without changing the reduction gear. Beyond the transfer case, the torque of the engine is transmitted by two shafts. The propeller shaft of the YaAZ-200 transmits a torque of 48 kilogram-meters, while the two propeller shafts of the YAZ-210 transmit a total torque of 72 kilogram-meters, that is, each shaft transmits less than 48 kilogram-meters. This makes it possible to vary the gear ratios in the transfer case without changing the standard reduction gear and without overloading the propeller shafts, when developing modifications of the six-wheel truck, such as tractor trucks, dump trucks, etc.

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c. It makes possible a longer propeller shaft leading to the rear bogie. Elimination of a short propeller shaft between axles and the use of two relatively long propeller shafts create a closed system of driving the axles. At the same time, the locked differential is more elastic and consequently less strained by the twisting moment created in the transmission when the drive wheels of the rear bogie rotate at different speeds.

The use of differentials in the reduction gears and of a third differential in the system eliminates additional stresses in the closed drive system of the driving axle of the rear bogie; thus the third differential is indispensable in six-wheel trucks. However, it reduces the roadability of the truck and should be made self-locking or be equipped with forced locking for difficult road conditions. The YaAZ-210 uses a third differential with four bevel spider pinions and with locking operated by a lever in the driver's cab.

Figure 1 shows the kinematic diagram of the YaAZ-200 transmission.

Table 3 gives the summary angles of the universal shafts, mounted on a standard 5,750-millimeter base (YaAZ-210 and 210A), and also for the chassis of tractor trucks and dump trucks with a base shortened to 4,780 millimeters (YaAZ-210G, 210D, and 210E).

Operating practice with heavy six-wheel trucks has proved these limiting angles of the propeller shafts acceptable when used with an ordinary universal joint.

The torque tubes are unified in cross-section diameter with those of the YaAZ-200 truck. The universal joints are similar to those of the YaAZ-200 in design, but larger. All propeller shafts are equipped with flange joints so that the shafts can be mounted and removed from the chassis without taking the universal joints apart.

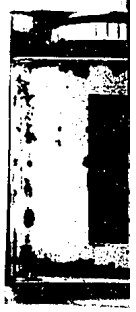
The transfer case serves as an auxiliary transmission and distributes the torque to the two axles. It also includes a third, locking differential. The case of the auxiliary transmission and the transfer case are separate and cast of iron. The two cases are bolted together, and the central shaft of the transfer case is integral with the auxiliary transmission main shaft. Thus, the auxiliary transmission and the transfer case form one whole.

Basic parameters of the transfer case are as follows: module of the gears, 5; length between centers, 165 millimeters. The number of teeth on the gears is shown in Figure 1.

The spiral gears are constantly engaged. For ease in shifting, a synchronizer is used, taken complete from the YaAZ-200 transmission. Rotation is transmitted by the common central shaft from the auxiliary transmission to the differential spider and then to the drive pinions of the transfer case through four bevel spider pinions.

At the rear end of the central shaft, the differential locking sleeve is spline mounted. When the sleeve is moved forward, its teeth engage the teeth of the drive pinion, and, connecting the drive pinion to the shaft, they throw the differential out of use. Locking the differential and releasing the locking sleeve are done by means of a lever in the driver's cab whether the truck is moving or standing still.

When a vehicle with a locked differential travels along a good road, additional twisting forces caused by differences in wheel diameter or winding roads arise in the transmission, which tighten the locking sleeve and make its disengagement difficult. In such cases, it is necessary to "jar" the truck to give the wheels a chance to turn (even up).



The differential lock should be engaged only for short, difficult stretches of road and immediately disengaged upon entering a good road, since it not only creates twisting forces, but also causes overconsumption of fuel.

The front end of the central shaft A-B (Figure 1) can be lengthened and a gear and engaging sleeve for front wheel drive can be mounted on it.

For power take-off, the lid of the auxiliary transmission case is replaced with a power take-off case.

Placing the central brake on the transmission makes it inconvenient to use the truck's winch when parking. The truck's brakes must be on when the winch is used. At the same time, the truck must be in neutral so that the motor can operate and drive the winch on the auxiliary transmission. The hand brake cannot be used. For situations like this, there is a clamp that fits over the foot brake pedal. Attempts to place the central brake in a different position on the transmission or change the drive of the brakes on the rear bogie make the design more complicated.

The transmission is completely unified with the transmission of the YaAZ-200. Basic parameters are: module of the gears, 4.25 millimeters; spiral gears' distance between centers, 165 millimeters; diameter of the projecting end of the main shaft, 55 millimeters; two synchronizers.

On the YaAZ-200 truck, the transmission has adequate reserve strength and is long lasting; consequently, we may expect that it will give fully satisfactory performance on the six-wheel truck.

The strength and wear resistance of the reduction gear, defined by the coupling weight, is the same as on the YaAZ-200, since the axle weight of one ton is the limit for the tires of both trucks. The same applies to the axle shafts, which differ only in length.

Brief overloading of the reduction gear is permissible when the intermediate differential is locked. The load on a truck reduction gear is measured by the size of the longitudinal load on the teeth of the driving pinion. Loads up to 286 kilograms on one centimeter of the length of the teeth in direct drive and up to 1,080 kilograms on one centimeter in low range (or according to coupling weight, with a coupling coefficient of 0.65) are permissible.

In direct drive, with the greatest possible torque of 48 kilogram-meters, the load on one centimeter of the length of the teeth equals 165 kilograms; in first gear (6.17:1), it equals 1,020 kilograms; and with a coupling weight of 10,000 kilograms, it equals 1,200 kilograms.

Thus, with an intermediate differential, the reduction gears of the six-wheel truck will not be overloaded.

2. Undercarriage

The load on the front axle of the six-wheel is 18 percent greater than the load on the front axle of the four-wheel truck. Since the overload was considered permissible, the front axle of the YaAZ-200 was used without change on the YaAZ-210.

The suspension of the rear bogie is of the balanced type and is in the form of a single spring mounted on both sides of the frame on rubber cushions located under the cross beams.

Jolting forces are transmitted through the springs, while reactive moment is taken up by two reaction rods extending from the reduction gear housing to the frame cross member. Rubber cushions in the spring bracket give the suspension good resilience and protect the springs from excessive stress when the bogie cross beams are askew.

The type of suspension used for the rear bogie has the advantage that it contains the minimum number of parts and swivel joints and is sufficiently resilient to withstand road irregularities with minimum twisting stresses in the springs.

Figure 2 shows the rear bogie suspension.

Rear springs are made of 55SG spring steel. The calculated tension in the springs under a full load is 4,180 kilograms per square centimeter; the number of oscillations is 140 per minute.

Front and rear wheels are completely unified with the wheels of the YaAZ-200 in design, size of bearings, wheel disks and rims, and tires. Tires with universal or extra traction treads can be used.

The frame is of riveted construction, with straight side members and six strong cross members. The side members are made of standard rolled stock, channel No 30a, with an insert of 8-millimeter sheet steel in the zones of maximum stress.

The steering gear and brake system are almost completely unified with the corresponding parts of the YaAZ-200. Only the length of the steering column and the fastening of the brake drum of the central brake have been changed. Brakes on the front and rear wheels are just like those on the YaAZ-200.

The pneumatic equipment of the brake drive is in the form of a single-line drive to the trailer with a combined brake cock.

Control levers are taken from the YaAZ-200, with the addition of a lever for the auxiliary transmission, which is to the right of the gear-shift lever, and the lever for locking the differential, which is to the right of the auxiliary transmission lever.

The fuel system is similar to the fuel system of the YaAZ-200. Provision is made for mounting one or two fuel tanks with a capacity of up to 225 liters each.

3. Cooling System and Exhaust

The basic dimensions of the radiator have been increased to correspond to the increased horsepower of the motor. Tube cross section and basic design elements of the tubular radiator were left unchanged and the radiator's height was increased. Band type (lentochniy) radiators are being installed temporarily on YaAZ trucks until the production of tubular radiators is organized.

The exhaust pipe is extended up over the left side of the cab to prevent the accumulation of exhaust gases when the truck is loading or unloading. At the same time, provision is made for attaching the exhaust pipe below, on the left side, as is usually done.

The truck platform is wooden on a universal metal base. Sides are removable, and the truck can be used with drop sides, fixed sides, stakes, or without sides. Standard fastening parts can be used on this universal platform. Future plans call for unifying the parts of the platform with the parts of the YaAZ-200 platform.

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The driver's cab is standard except for changes in the floor made necessary by the additional control levers.

Visibility is somewhat reduced because the hood has been lengthened by 300 millimeters; however, visibility is still good.

Because of the lengthening of the power aggregate by 300 millimeters, the rear section of the truck is longer than that of the YaAZ-200 and is unified in all possible elements.

The basic parameters of the six-wheel YaAZ-210 truck are as follows:

Type	6 x 4	
Load capacity (tons)	12	
Length (mm)	9,645	
Width (mm)	2,650	
Height (mm)	2,560	
Base (mm)	5,750-1,004	
Track of rear wheels (mm)	1,920	
Track of front wheels (mm)	1,950	
Clearance of loaded truck (mm)	300	
Turning radius according to the track of the outer wheels (m)	12	
Angle of approach (with load)		
Front (deg)	48	
Rear (deg)	25	
Maximum speed with governor operating, on level highway (km/hr)	55	
Angle of ascent on hard ground with full load, in first gear (deg)	20	
Full weight of the towed trailer (tons)	up to 15	
Distribution of weight among the axles	(kilograms)	(percent)
Without load, front axle	3,870	36.5
Without load, rear axle	6,730	63.5
Without load, total weight	10,600	100.0
With load, front axle	4,220	18.5
With load, rear axle	18,590	81.5
With load, total weight	22,810	100.0
Fuel consumption per 100 km (liters)	55	

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Capacity of fuel tanks (liters)	450
Engine	Two-cycle Diesel with uniflow scavenging
Number of cylinders	6
Diameter (stroke) of pistons (mm)	108 x 127
Displacement (liters)	6.972
Compression ratio	16 : 1
Maximum horsepower	168
Maximum rpm	2,000
Fuel consumption (g./e. s. ch) [grams per erg centimeter hour ?]	205
Clutch, single disk, dry, with driving disk diameter of (mm)	381
Transmission	Three way, five speed, with two synchronizers
Gear ratios [of transmission]	
First gear	6.17 : 1
Second gear	3.40 : 1
Third gear	1.79 : 1
Fourth gear	1.00 : 1
Fifth gear	0.78 : 1
Reverse gear	6.69 : 1
Transfer case	Two stage, with intermediate differential
Gear ratios [of transfer case]	
Without reduction gear	1.07 : 1
With reduction gear	2.13 : 1
Main transmission	Double reduction gear
Gear ratio [of main transmission]	8.21 : 1
Type and number of wheels	Stamped; 10 plus 2 spares
Tires	12.00 x 20
Tire pressure (atmospheres)	

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Rear wheels	5.5
Front wheels	5.0
Brakes	Foot brakes: shoe type, on all wheels, pneumatic drive. Handbrakes: central, drum type
Generator	Shunt wound, four pole, 12 volt
Starter	24 volt, 7.5 horsepower
Storage battery	12 volt. 180 ampere hour, (typ 6STE 180-2 units)
Platform	Wooden, with removable sides, universal
Inner dimensions [of platform] (mm)	
Length	5,770
Width	2,450
Height	820

4. Operating Data

Up to 1 March 1949, an experimental YaAZ-210 truck had traveled 20,000 kilometers over various types of roads in various weather conditions.

The average fuel consumption in this period was 55 liters per 100 kilometers.

The truck has good dynamic qualities which correspond in every way with those planned, but its maneuverability is limited.

The truck's roadability is satisfactory, and in winter conditions it is good. The roadability of the six-wheel YaAZ-210 is limited by its great weight (because of the limited capacity of some bridges) and its great size (making it difficult to travel along narrow roads); however, in all the tests, the truck's roadability was better than that of the wartime MAK [Mack] truck.

Using the YaAZ-210 truck as a basis, models of heavy six-wheel trucks and tractor trucks for various purposes have been built.

YaAZ-210A Six-Wheel Truck

The YaAZ-210A truck, equipped with a winch and a metal platform, was built to carry heavy, indivisible loads. Main differences from the basic truck are as follows:

The platform has low, nonremovable sides and a drop back. Sockets are provided for inserting side stakes to increase the platform's capacity.

Inner dimensions of the platform are: length, 5,340 millimeters; width, 2,340 millimeters; height of sides, 500 millimeters; and platform area, 12.5 square meters. With the inserted side stakes, the platform is suitable for general hauling.

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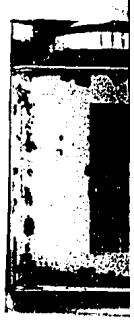

Behind the cab, there is a drum-type winch with a brake. The winch is driven from the transfer case by a power take-off box. The main drive system of the winch is shown in Figure 1.

The propeller shaft and the needle universal joint of the GAZ-51 transmit power to the sprocket gear shaft, which is mounted in a special support. From the sprocket gear, power is transmitted by a chain 25 millimeters long to a sprocket gear on the winch shaft. The sprocket gear shaft is made as a unit with the winch shaft.

An automatic bank brake is mounted on the opposite side of the sprocket gear. This brake stops the winch when the cable is tight and the drive is disconnected. The power take-off lever is in the cab, between the auxiliary transmission lever and the differential locking lever.

The winch is operated by means of the engaging lever, the brake lever, and the handle of the control cock of the clutch pedal located on the winch.

The winch (Figure 3) can operate in any gear. Specifications of the winch are: maximum tractive force, 15 tons; cable diameter, 21.5 millimeters; length of cable, 100 meters. Maximum tractive force on the cable is limited by a special governor which turns off the engine if the limit is exceeded.

The winch cable can be led along the floor of the platform for loading heavy freight, or led under the platform to pull the truck out of bad spots or to haul heavy loads. The winch cable can be fed out only backward.

One spare wheel is attached to the left side of the frame on a standard bracket; the other has no bracket and is carried on the platform.

The fuel tank is located on the right side of the frame and has a capacity of 225 liters, enough for a run of 410-450 kilometers. This is sufficient for a YaAZ-210A truck intended for service within a limited area.

Distribution of weight among the axles is as follows:

	Unloaded (kg)	Unloaded (%)	With 12-ton Load (kg)	With 12-ton Load (%)
Front axle	4,070	36.3	4,210	18.0
Rear axle	7,130	63.7	19,200	82.0
Total	11,200	100.0	23,410	100.0

Length of the YaAZ-210A is 9,500 millimeters (less than the YaAZ-210 because of a reduction in the overhang); the width is 2,638 millimeters and the height is 2,560 millimeters.

YaAZ-210G and YaAZ-210D Tractor Trucks

Experimental models of the YaAZ-210G truck with a ballast platform and the YaAZ-210D with a saddle-type mounting have been built.

The chassis of both these tractor trucks is 4,780 millimeters long, 970 millimeters shorter than that of the YaAZ-210. Overhang of the frame from the center of the bogie to the end of the frame side members has been reduced by 1,000 millimeters to 1,450 millimeters. The transfer case has been moved forward 359 millimeters. The propeller shafts extending from the transfer case to the rear bogie have been shortened by 611 millimeters. The rear towing cross member of the frame has been reinforced.

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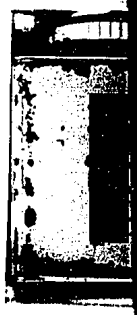

The spare wheel brackets have been removed from the chassis and transferred to the ballast platform on the YaAZ-210G and to the semitrailer on the saddle tractor truck.

The gear ratio of the constant gear in the auxiliary transmission of the 210G has been increased from 1.07 : 1 to 1.41 : 1. The standard reduction gear has been retained, which gives a gear ratio of 11.6 : 1 in the main transmission. Maximum speed is correspondingly reduced to 45 kilometers per hour in overdrive.

In the saddle tractor truck, the gear ratio of the auxiliary transmission is increased from 2.13 : 1 to 2.28 : 1 to increase the roadability of the truck and trailer.

The weight without load is distributed among the axles as follows:

	Ballast Tractor Truck 210G		Saddle Tractor Truck 210D	
	Kg	%	Kg	%
Front axle	4,080	35.4	4,090	41.0
Rear axle	7,540	64.6	5,850	59.0
Total weight	11,620	100.0	9,940	100.0
Dimensions (mm)				
Length	7,375		7,375	
Width	2,650		2,638	
Height	2,580		2,570	

An analysis of the dynamic (qualities) of the tractor trucks produced these conclusions:

1. The load capacity of the trailers may be set at 25 tons.

2. The saddle tractor and semitrailer combination has better dynamic qualities than the ballast platform truck because it has a smaller total weight and a greater trailer weight.

The undercarriage of the chassis and the steering elements are not subjected to loads greater than those on the basic truck. Consequently, their reliability and length of service on the tractor trucks should be the same as on the six-wheel truck. The engine and transmission aggregates will carry loads above the norms set for the basic truck because of the increased gear ratio in the transmission. In other words, the norms for length of service of these parts will be below the norms of the same parts on the basic truck.

Length-of-service norms for units of the transmission remain within the limits of the norms set for the basic truck, since the coupled weight of the tractor truck does not exceed the coupled weight of the basic truck.

The YaAZ-210G is equipped with a ballast platform with a dropping back. The front of the platform has two recesses for the spare wheels. There are a boom and block for raising and lowering the wheels.

Internal dimensions of the platform, not including partitions are: length, 3,076 millimeters; width, 2,640 millimeters; height of sides, 600 millimeters; volume, 4.9 cubic meters.

The winch is identical with the one on the basic truck. The cable comes out under the platform. The cable can also be brought forward, on the outside of the frame left side member.

The YaAZ-210D saddle tractor truck is equipped with a double-pivot saddle with an automatic lock under the pivot bolt of a trailer of standard dimensions. The height of the saddle unit above the chassis is 282 millimeters. The center of the pivot bolt is 50 millimeters in front of the center of the rear bogie. The diameter of the pivot pins is 50 millimeters. The guide from the rear end of the frame to the saddle apparatus has an angle of inclination of 9 degrees.

The winch is the same as the one on the six-wheel truck. The cable can be led out only backward. The guide rollers are located on the semitrailer. The fuel consumption when operating with a trailer and under various loads is estimated according to calculated data and is subject to correction after experimental models are tested. Fuel consumption is as follows:

Model	Load Capacity (tons)	Fuel Consumption (liters per 100 ton km)	Relative Fuel Consumption (%)
YaAZ-200	7	5.00	100.0
YaAZ-210	12	4.58	91.5
YaAZ-210G	25	4.00	80.0
YaAZ-210D	25	3.60	72.0

Because of the great weight, length, and width of truck trains (tractor truck pulling a number of trailers), their maneuverability is limited. The truck train conforms to road-capacity limitations according to specific axle loads (a limit of 10 tons per axle), but the full weight (up to 55 tons) may prove to be an obstacle in crossing bridges of limited load capacity.

The use of truck trains with YaAZ-210G and YaAZ-210D tractor trucks may be recommended for hauling on highways.

YaAZ-210E Dump Truck

The design of a dump truck on a six-wheel chassis with a shortened base and a capacity of 10 tons has been developed, and an experimental model is being built. The dump truck has the following specifications for distribution of weight among the axles:

Without load	Kg	%
Front axle	3,930	35
Rear axle	7,250	65
Total weight	11,180	100
With load		
Front axle	4,250	20
Rear axle	17,100	80
Total weight	21,350	100

The dimensions of the dump truck in millimeters, are: length, 8,130; width, 2,650; height, 2,710.

The bucket-type platform is made of metal, has a removable back and a protective shield for one fourth the width of the cab, and is designed for use with an excavator having a capacity up to 5 tons.

The internal dimensions of the platform in millimeters, are: length, 4,385; width, 2,434; height of sides, 750. The platform tilts only backward, at an angle of 60 degrees.

Provision is made for extending the sides to increase the capacity of the platforms. Platform capacity without extended sides is 7.75 cubic meters. With a natural angle of slope [of the load], the capacity of the platform is 10 cubic meters.

The hoisting mechanism is hydraulic, two cylinder, with lever motion. The cylinder diameter is 180 millimeters, the same as on the MAZ-205 dump truck. The stroke of the rod has been increased to 800 millimeters. The lever mechanism has variable arms. When lifting begins, the force is increased by reducing speed; when an angle of 30 degrees is attained, the speed is increased. Calculated time for reaching an angle of 60 degrees is 17 seconds.

The gear-type pump and the rotary-type control valve are mounted on the same cross member as the cylinders. This makes it possible to make all the pipelines stationary and of metal, and to eliminate the use of flexible hose.

The pump is driven from the power take-off box on the lid of the auxiliary transmission (unified with the lid on the YaAZ-210A) through the propeller shaft with two GAZ-51 universal joints. Maximum angle of the propeller shaft in the space is 13 degrees.

The power take-off is controlled by a lever in the driver's cab, just as in the tractor truck. The hoisting mechanism is controlled by a horizontal hand lever beside the seat. When the hand lever is parallel to the seat, it is in the neutral position; when it is all the way forward, it is in the lifting position; midway between these two positions is the lowering position.

The dump truck employs a transfer case with a constant gear ratio of 1.41 : 1 and an auxiliary transmission with a gear ratio of 2.28 : 1. This reduces the maximum speed to 45 kilometers per hour, but improves the truck's dynamic qualities. The dynamic factor equals 0.055 kilogram per kilogram.

Maximum angle of ascent is 24 degrees. Forward angle of approach (loaded) is 48 degrees; rear angle is 55 degrees.

[Appended tables and figures follow.]

Table 1. Fuel Consumption

Model	Fuel Consumption (liters per 100 km)	Load Capacity (tons)	Fuel Consumption (liters per 100 ton-km)	Relative Fuel Consumption (%)
GAZ-MM	20.5	1.5	13.65	274.0
GAZ-51	26.5	2.5	10.60	212.0

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Model	Fuel Consumption (liters per 100 km)	Load Capacity (tons)	Fuel Consumption (liters per 100 ton-km)	Relative Fuel Consumption (%)
ZIS-5	34.0	3.0	11.30	226.0
YaG6	43.5	5.0	8.70	174.0
ZIS-150	33.0	4.0	8.25	165.0
YaAZ-200	35.0	7.0	5.00	100.0
YaAZ-210	55.0	12.0	4.58	91.5
YaAZ-200 with trailer	50.0	13.0	3.84	77.0

Table 2. Unified Parts of YaAZ-210 and YaAZ-200

Unit	Quantity of Part Designations			Unification (%)
	YaAZ-200	YaAZ-210	Total	
Engine	729	147	876	83.2
Clutch	32	4	36	90.0
Clutch engagement drive	41	--	41	100.0
Transmission	122	--	122	100.0
Transfer case	36	76	112	32.1
Propeller shafts	23	25	48	47.9
Rear axle	49	14	63	77.8
Frame	31	12	43	72.1
Suspension	75	62	137	54.7
Front axle	42	--	42	100.0
Wheels	54	16	70	77.1
Steering gear	36	3	39	92.3
Brakes	332	9	341	97.3
Electrical equipment	89	7	96	92.7
Instruments	25	7	32	78.1
Cab	494	12	504 [sic]	97.6
Rear end	77	21	98	78.6
Platform	50	65	115	43.5
Total	2,399	482	2,881	83

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Table 3. Summary Angles of Propeller Shafts

	Maximum Summary Angle			
	Static Position		Maximum Skrew of Axles	
Base (mm)	5,750	4,780	5,750	4,780
First axle	2° 23'	4° 33'	6°28'	11°57'
Second axle	13° 23'	14° 28'	18°41'	20°27'
At intermediate support	7° 25'	13° 57'	--	--

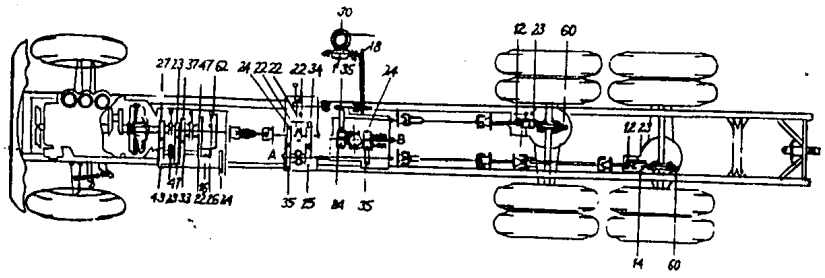

Figure 1. Kinematic Diagram of YaAZ-210 and YaAZ-210A Transmissions. A - B is a one-piece shaft. Figures indicate number of teeth on gears.

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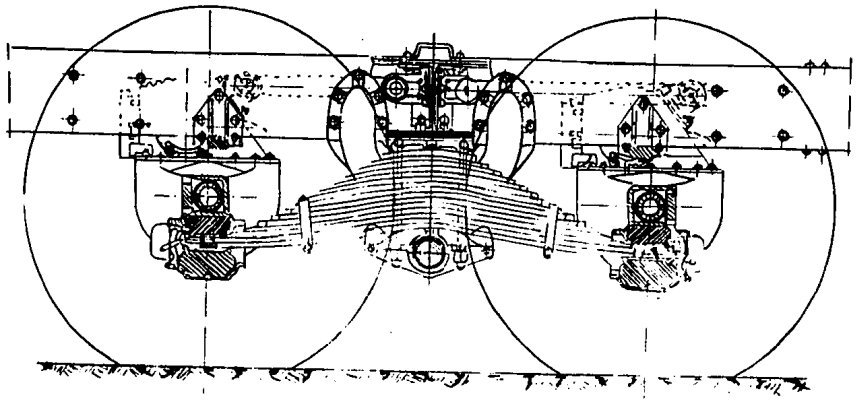

Figure 2. Rear Bogie Suspension

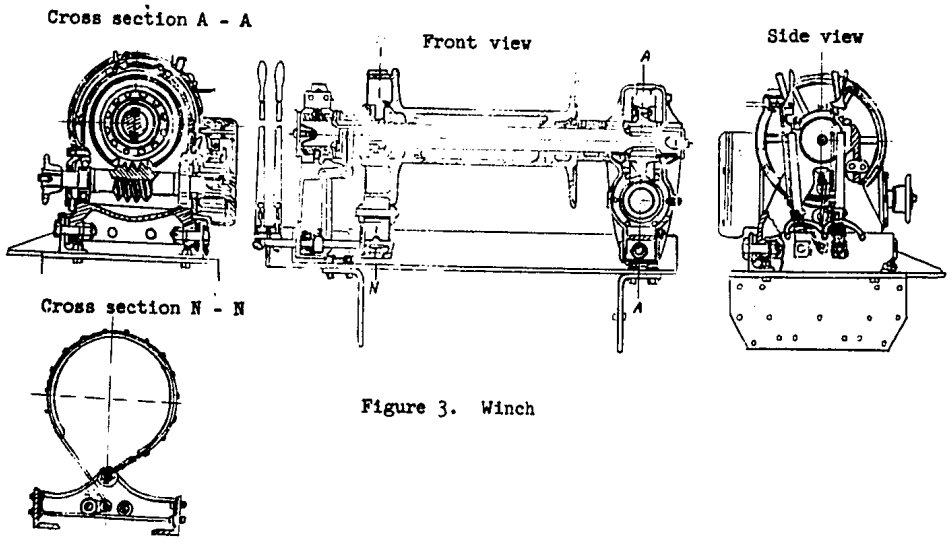

Figure 3. Winch

- E N D -